Honors Chemistry - Solutions Problem Set

Stasya

1. What determines whether a solute will be soluble in a given solvent? Give a complete answer.

2. Why are gases less soluble at high temperatures?

3. Explain the difference between a saturated and unsaturated solution, both in definition and physical properties.

4. What is a suspension and how is it different from a colloid? Explain the difference in definitions and physical properties.

5. Calculate the percent by mass of 3.55 g NaCl dissolved in 88 grams of water.

6. Calculate the molarity of a 9.33 g sodium sulfide in 450.0 mL of solution.

7. Calculate the molality of 20.0 g calcium chloride in 700.0 g of water.

8. Calculate the mole fraction of the salts in 15.7 g sodium chloride in 100.0 g of water.

9. How many milliliters of 0.400 M HBr solution can be made from 50.0 mL of 8.00 M HBr solution?

10. What is the molarity of the solution when 30.0 mL of 1.75 M HCl is added to 80.0 mL of 0.450 M HCl?

11. You have a container of powdered copper(II) sulfate and all standard lab equipment. For a lab, you need 1.00 L of 2.00 M solution. Create a numbered list describing the steps neccesary to create the solution.

12. Explain a particle level why the vapor pressure of a solution is lower than a pure solvent.

13. A rock salt (NaCl), ice, and water mixture is used to cool milk and cream to make homemade ice cream. How many grams of rock salt must be added to water to lower the freezing point by 10.0°C?

14. Write the formula for Copper(II) chloride and indicate if it is a weak or strong electrolyte.

15. Write the formula for hydrochloric acid and indicate if it is a weak or strong electrolyte.

16. Calculate the K_{sp} of the salt MgF_2, whose solubility is 2.7×10^{-3} mol/L.

17. Fill in the blank. Dry cleaners use tetrachloroethylene, C_2Cl_4, to dissolve oil, grease, and alcohol because C_2Cl_4 is a(n) _____ molecule.

18. What is freezing point depression?

19. Consider a solution of 50. g of KCl, a strong electrolyte, dissolved in 1.5 kg of water. Determine the expected freezing point of the solution.

20. What is the mole fraction of barium chloride when 75.2 g are mixed with 124.8 g of water?

21. Iron(III) chloride can be produced by reacting Fe_2O_3 with a hydrochloric acid solution. How many milliliters of a 6.00 M HCl solution are needed to react with excess Fe_2O_3 to produce 16.5 g of $FeCl_3$?

22. Concentrated sulfuric acid contains very little water, only 5.0% by mass. It has a density of 1.84 g/mL. What is the molarity of this acid?

23. A solution containing 3.23 grams of an unknown compound dissolved in 100.0 grams of water freezes at -0.97°C. The solution does not conduct electricity. Calculate the molar mass of the compound.

24. A 3.0 molal solution of naphthalene in cyclohexane boils at 89.4°C. What is the boiling point of pure cyclohexane? Although solid naphthalene is slightly volatile, assume its volatility is zero in this calculation. The k_b value for cyclohexane is 2.80°C/m.